# Composite Dock Hose care, Use & Maintenance

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1. **Novaflex Composite Dock Hose Testing & Inspection Program**

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**1.1 Introduction** - This instruction booklet is intended solely for the use of The Novaflex Group customers as a guide for hose Care, Use & Maintenance of Dock Hoses. This booklet is not intended for distribution to the general public. In all cases readers are instructed to follow local, state and federal guidelines, requirements and law regarding safety and environmental issues. For additional information see Novaflex's general "Hose Care Use & Maintenance" Booklet.

All customers are expected to follow all prudent safety warnings and instructions throughout the process of inspection, testing, and handling of hose products. This booklet is not intended to cause or promote the selection of a particular hose product or coupling. With respect to the operating of Dock Hose, their uses and applications, the reader should rely upon and closely follow the local plant and mandates imposed by regulatory agencies as to the capability and limitations, as well as the proper use of the product (always refer to Novaflex specific product operating information by specification number).

All tests performed on hoses involved in this instruction manual are non-destructive. Non-destructive tests are conducted on a length of hose or hose assembly and are for the purpose of eliminating hoses with flaws, damage or weakness due to previous operating conditions which cannot be seen by visual examination.

**1.2 PRESSURE TEST WARNING**

Before conducting any pressure test on hose, provision must be made to insure the safety of the personnel performing the test and to prevent any possible damage to property. Only trained personnel using proper tools and equipment should follow detailed procedures when conducting pressure test.

1. Personnel must wear all appropriate personal safety equipment – not limited to hard hat, eye protection, protective clothing, gloves, safety shoes, breathing equipment, etc.
2. Air or any other compressible gas must never be used as the test media because of the explosive action of the hose should a failure occur. Such a failure could result in damage to property and serious bodily injury.
3. All air should be removed from the hose by bleeding it through an outlet valve while the hose is being filled with the test media. Novaflex will only use water as the test media.
4. Hoses to be pressure tested must be restrained by the placing of sandbags on top of the hose at each end of the hose. On long lengths of hose sandbags can be placed alongside of the hose to prevent whipping in the event of a failure.
5. The outlet end of the hose is to be backed up with piled sandbags to prevent an ejected fitting from propelling any distance.
6. Provision must be made to protect testing personnel from the forces of the pressure media if a failure occurs. All personnel should be clear of the hose testing area to prevent the effects of the pressurized water from causing bodily injury.
7. Testing personnel must never stand in front of, in back of, or on top of the hose being pressure tested.
8. When testing is in process, adequate alarms and signs should be placed in the general area to advise all nonessential personnel to avoid the test area.

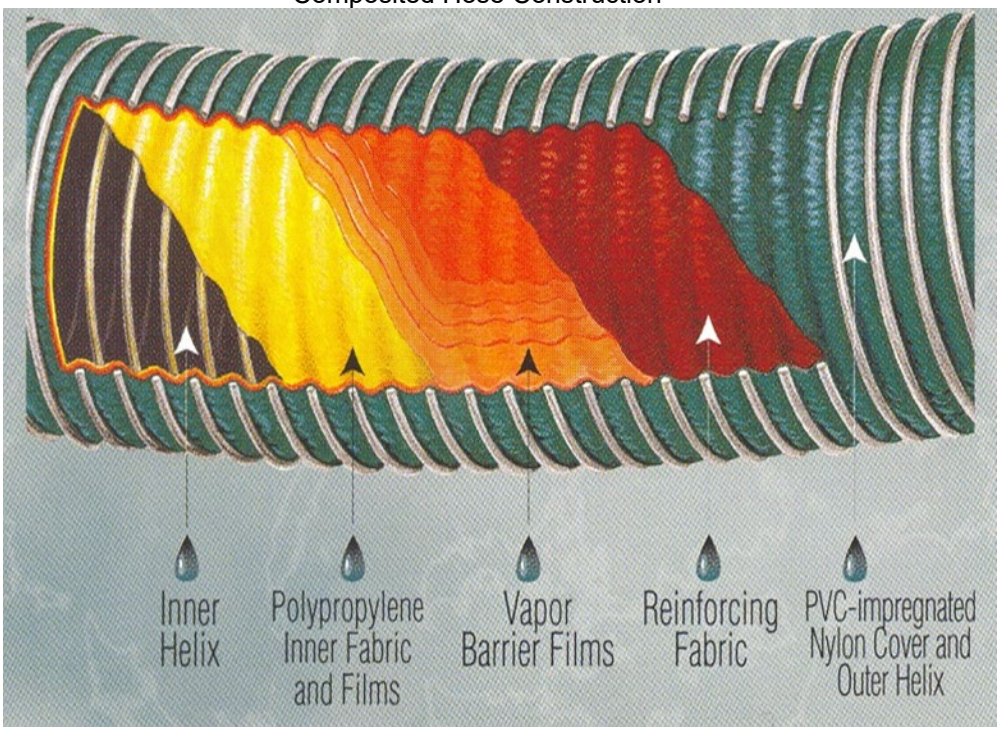
**2. Personnel Training Program for Novaflex Hose Coupling and Testing**

**2.1 Personnel Requirements -** It is important in any hose-testing program that the human factor is taken into consideration. The individuals responsible for the inspection and testing of our hose products must be properly trained and competent. The minimum requirements should include:

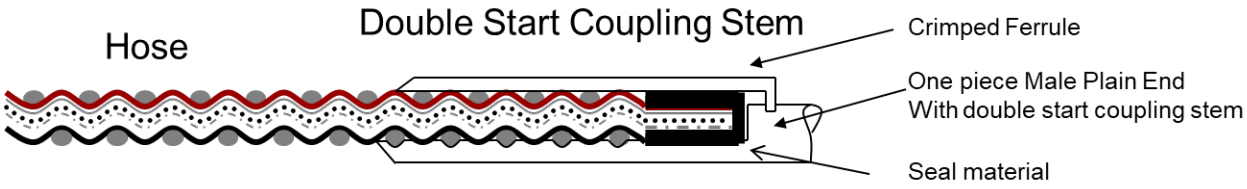
a. Ability to read and write Basic English.
b. Possess basic math skills so that they can read and understand:
    i. Instructional documents
    ii. Pressure gauges
    iii. Test procedures
    iv. Acceptance charts
    v. Label and test products
    vi. Measuring equipment and coupling data sheets

**2.2 Hose Inspection –** Composite hose is generally accepted to be lightweight and very flexible. These advantages can also lead to problems since composite hose is not as robust as rubber dock hose making is easier to damage. Each hose tester or hose operator may be responsible for testing and inspecting hose. It is also important that the hose be physically inspected before each use. In the case of retesting used hose, inspect the assembly in its entirety both internally and externally so that it does not present a safety hazard regardless of its ability to withstand pressure. The object of this procedure is to detect any weakness in the structure of a hose assembly before a weakness might cause the failure of the hose in service. While these testing and inspection procedures may apply to any hose, it is specifically tailored to Dock Hose (either used or unused). The intent is to prevent the release of the material being conveyed in a hose under pressure that could result in serious injury to personnel, property damage, or pollution to the environment.

Composited Hose Construction




The design of composite hose incorporates an inner and outer helix wire. The function of these wires is to sandwich (hold) the inner elements of hose cover and various carcass fabrics and films together. The coupling is attached by crimping the coupling to the hose carcass, using a gasket for a final sealing.




**2.1 Composite Dock Hose -** The Dock Hose inspection procedure consists of three main elements (some of the elements are more applicable to hose that has previously been in service).

**2.1.1 External inspection (no pressure)**

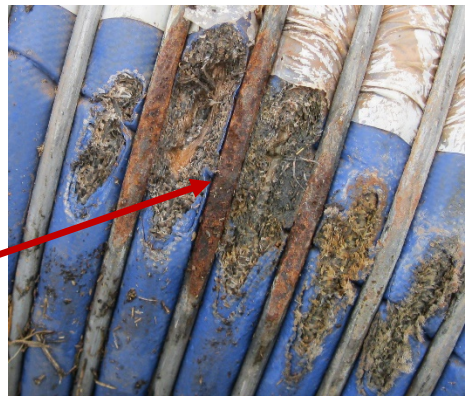
The external portion of the hose or its "cover" serves the primary function of protecting the reinforcement members of the hose from physical or chemical damage. The cover should be carefully examined in order to detect areas where possible reinforcement damage may have occurred and or movement of the outer helix while.

Any cuts, abraded areas, cracks in the cover that result in exposing the reinforcement textile, must result in the hose being retired from service. It must be remembered that the hose cover may show signs of surface damage due to prolonged exposure to sunlight, ozone, and/or chemicals, but this by itself does not require the hose to be removed from service unless it completely penetrates the cover down to the hose reinforcement. If any wire on the hose is broken, remove the hose from service immediately.

Examples of cover damage that requires the hose to be retired from service:

Cover damage well into the reinforcement along with wire movement

Abrasion through the cover with outer wire displacement



Severe cover abrasion

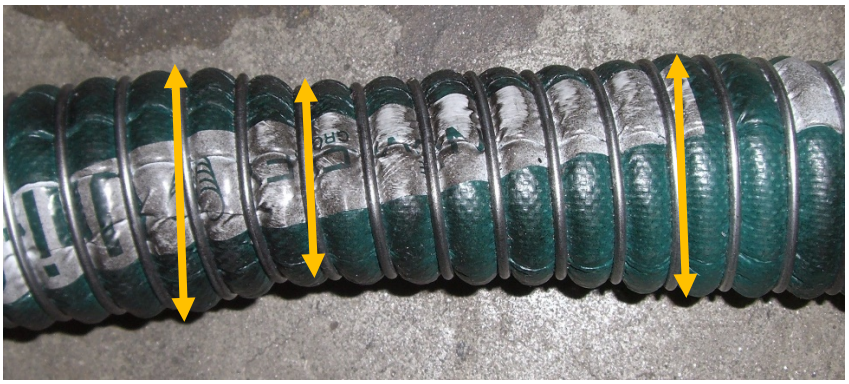
Cover attacked by chemicals or sever age

Severe wire abrasion/cutting

Displaced outer wire is usually the result of over bending

Hose cut and ID exposed showing inner wire movement

- If a hose is kinked (kink is where the hose is dented or becomes out of round) or mashed flat, this hose must be removed from service. <u>Displaced wire from a kink will result in a hose failure.</u>



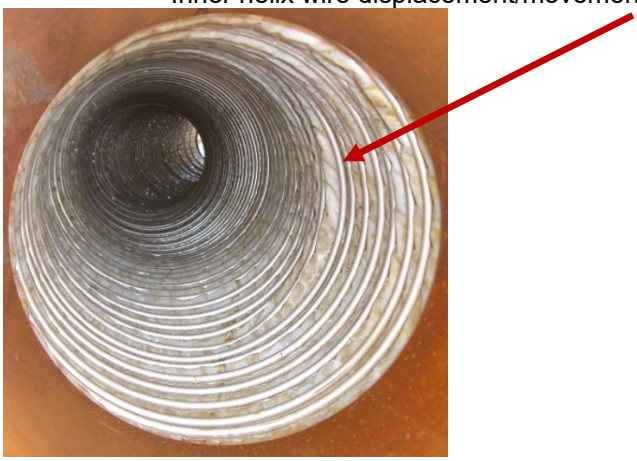
Hose kinked

### 2.1.2 Internal Inspection

This inspection mainly applies to product that has been in service, but should be performed on all hoses during the installation process. The internal inspection must be performed through the use of back lighting or a flashlight shown down through the hose interior. Observe as much of the inside diameter of the hose as possible. Where this is not practical because of extremely long lengths, the end of the hose inspected must be considered representative of the entire length. (This would not be the case if there is evidenced of cover damage on the outside of the hose previously noted during the external inspection.

Cause for rejection of hose during the internal inspection is usually a result of the tube being subjected to product it was not designed to handle resulting in melted or damaged exposed textile. The following phenomena if observed must result in the entire hose length being retired from service.

- Inner helix wire displacement/movement – generally due to over bending



- Tube worn excessively or deteriorated

- Inner Helix wire rollover – result of over bending


Outer wire displaced

View looking in from coupling Inner wire has rolled/moved

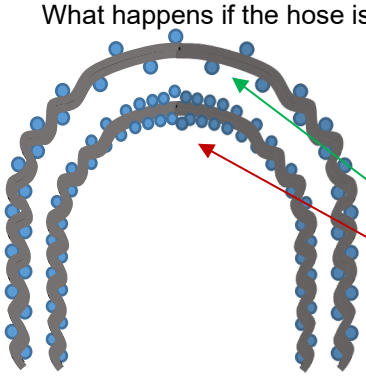
This type of hose damage is a function of over bending composite hose. Typically composite hose is considered to be very flexible and the user can have a tendency to over bend the hose. Composite uses a concept that the inner and outer wires keep the wires in place due to their displacement of the hose

reinforcement. The reinforcement plies are formed around these wires and keep the hose conforming to it shape. This concept also is what makes the hose very flexible.

Simplified representation of hose design

1. Outer Wire
2. Hose Carcass
3. Inner Wire

The pressure of the inner wire against the outer wire holds the hose together.
What happens if the hose is over bent?



When the hose is bent beyond its minimum bend radius the inner wires on the inside radius of the hose bend are compressed so much that they can be moved. On the outside of the bend radius the hose carcass is stretched almost straight and this can permit the wires to slide.

a. Wire spread open
b. Wire bunched and over lapped

This can result in wire movement, resulting in what is seen.

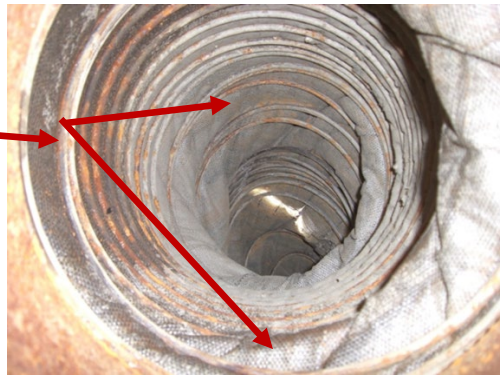
### 2.1.3 Coupling Inspection

Each style of fitting must be inspected based upon its own merits and requirements. This process involves the wiping of the inside of the coupling and the outside of the coupling with a rag prior to inspecting.* If the following phenomena if observed requires that the fitting be rejected and removed from the hose and serviced.

a. Any worn parts that prevent the fitting from performing its designed function.
b. Damage to any safety devices, which result in them not working correctly.
c. Threads worn or damaged
d. Excessive corrosion or rust
e. Any cracks observed in any part of the fitting
f. Flange face damage – scratched or nicked
g. Coupling Movement

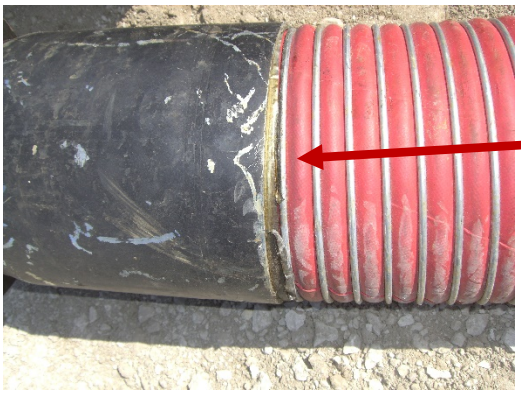
Used hose must be inspected closely in the area just behind the fitting to make sure there is no evidence of stress on the hose caused by pulling and/or hanging of the hose against the coupling shank. If this is observed the hose must be removed from service.

Damage from over bending



Inside damage to inner wire where coupling meets hose

All couplings must be inspected for evidence of coupling movement. If movement has taken place there will be marks or scuffed areas just behind the coupling ferrule. If this is observed, the hose must be removed from service.




### 2.1.4 Method of Attachment

Novaflex Composite Dock hose utilizes a crimped coupling with flanges. Novaflex recommends the use of a floating flange on one end to eliminate hose torque when installing the hose. In the application, the hose must be installed to insure hose movement does not induce torque.

Once the hose assembly has passed this inspection procedure, it must then be hydrostatically pressure tested in accordance with local, state & federal requirements.

## 2.2 HYDROSTATIC TEST PROCEDURES

All personnel performing hose testing must take all necessary safety precautions due to the explosive potential should a hose rupture or coupling be ejected. Personal safety gear must be worn such as Hard Hat, protective clothing, safety shoes, gloves and eye protection, etc.

To obtain maximum efficiency and safety in using testing hose, hose couplings and other connections (valves etc.) they must be of the proper type (pressure ratings to match the testing) and be installed in a manner recommended by the manufacturer. Based on the specific type hose & Coupling involved used the appropriate testing criteria per NAHAD, USCG, BS-EN, ISO and others.

- Connect test pump to water source.
- Connect manifold to test pump (a manifold can be used to test multiple length at one time).
- Layout straight the lengths of hose to be tested. Dock hose should be tested on hose dollies so that the hose can move freely during the test. (Composite dock hose will elongate during testing.) NOTE: These hoses should have passed a previously visual inspection per prior instructions.
- Attach hose to the manifold.
- Install blind test flanges with new gaskets complete with valves on the hose ends. NOTE: one end of hose should be elevated to allow any trapped air to escape. Tighten all connections.
- Begin to fill hose with water. Be sure ball valve is open to allow trapped air to escape from the hose.
- After all air is bled off, close outlet and allow test pump to build pressure to working pressure levels outlined by USCG & NAHAD procedures.
- While under pressure at working pressure (never higher than working pressure), examine each length for leaks (especially near the couplings). Finally, inspect for any coupling movement.
- Any hose that leaks or shows signs of wear, bulging or swollen areas should be retired from service.
- After inspection at working pressure, raise the pressure to 1.5 times the working pressure or Test Pressure. Test time is also in accordance with USCG/NAHAD, or local, state or federal requirements. Test should never be shorter than 10 minutes.
- During the test, all ends should be secured and protected should a coupling come off.
- Upon completion, turn off test pump.

- Open valve and drain water.
- All used couplings, if required, should be buffed, oiled, and all gaskets replaced.

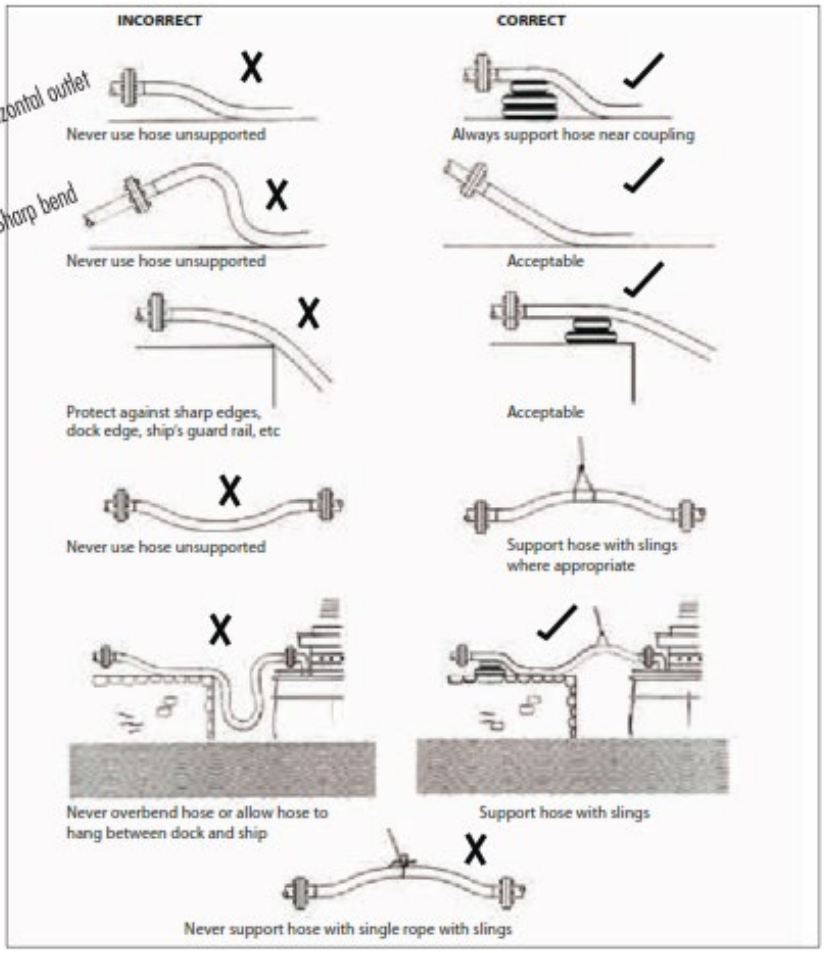
**2.3** Proper records should be kept showing the date of the test. The Hose length should be appropriately tagged with the test date and all pertinent data

Once all the inspections and testing have been completed a Dock Hose can be placed into service. This testing should be repeated at least every 6 months. **Remember, each hose should be visually inspected before each use for external damage.**

3. **Dock Hose Application & Handling** – This section is a guide line presented to assist in the customer in obtaining maximum service life. Every installation has different requirements and different equipment to handle Dock Hose. Below are basic suggestions to facilitate hose handling.

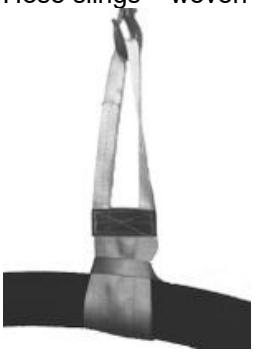
Each Composite Dock hose should be only be used to transfer the media listed in the Novaflex Chemical Resistance Charts and at the pressures and temperatures listed on the hose label (if a chemical is not found contact Novaflex or check www.novaflex.com. In the effort to maximize safe hose life, and in line with OCIMF guidance, Novaflex takes a conservative approach to velocity in composite hose, and recommend that the maximum velocity not exceed 23 ft./sec with a fluid viscosity of 400 cSt (400 mm²/s). This flow velocity should be further reduced where a known accumulator liquid is transferred.

**a. Typical correct & incorrect handling situations**

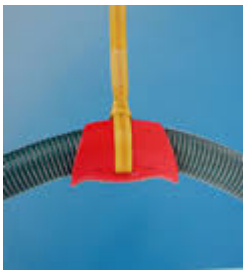
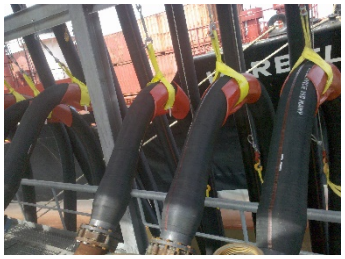



b. Novaflex recommends the use is lifting slings (min. 12" wide), lifting buns and cradles designed to reduce stress on the hoses.

i. Hose slings – woven strapping that included a center portion with a wide support area.



ii. Hose buns that are excellent for listing and provides superior support to the hose.

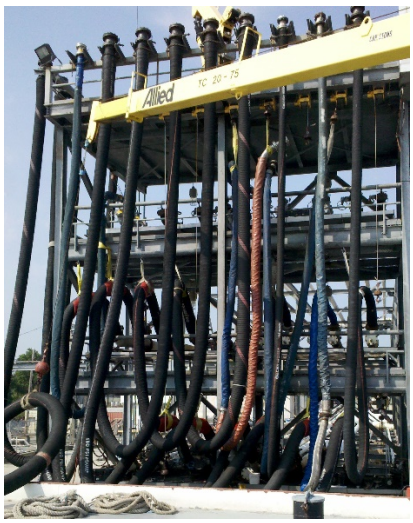




iii. Hose dollies – for moving the hoses on a hard surface

iv. Supporting cradles – custom devices/supports and hose towers made for a specific application.


Hose Saddle

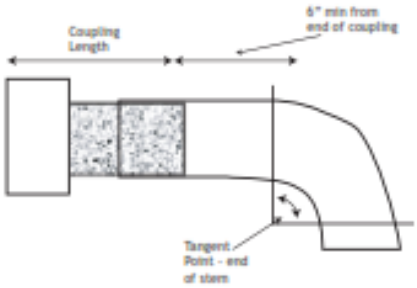

Modern Hose Tower



Combination Hose Tower

c. All of the above devices should be installed so that the hose is installed at 1.5 times (or greater) the min. bend diameter to provide maximum service life. Never bent the hose tighter then the minimum bend radius. The handling devices should be designed to accommodate a variety of hose sizes where possible. There are many styles of Dock Hose based on specific design requirements due to regulatory requirements, these hoses have different ends, weights and range in outside diameters.

d. Dock hose can be installed in a variety of positions. It is important to support all dock hose as shown in para. 3 a. When other installations are required it is important to insure that the end of the hose is supported so that the bend is moved away from the tangent point starting at the point where the ridged steel part of the coupling meets the rubber hose.




Novaflex bend restrictors can be employed to assist in moving the bend away from the end of the coupling.

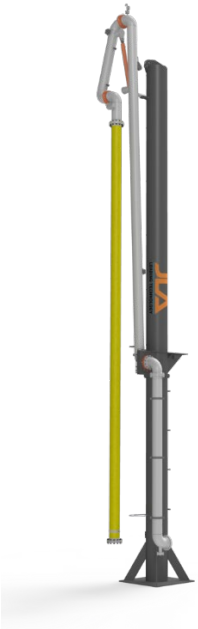
**4.** Due to the possible heavy weight of flanges, end couplings and the use of valves, it is important to insure that when lifting an end of the hose that the lifting device or sling be used correctly. <u>This downward flex force puts a stress on the hose and can cause damage (depending on hose ID this weight can be as heavy as 500 pounds with a valve).</u>

a. If the hose to be lifted is 4" to 10" ID with only **<u>blind flange and coupling</u>**, support the dock hose within 3–4' ft. of the flange always maintaining a horizontal plane.

b. If the hose to be lifted is 4” to 10” ID with **blind flange, coupling and a valve**, support the dock hose behind the flange and further away from the coupling always maintaining a horizontal plane.
c. Always support the hose with recommended hose supports.
d. Cushion or protect the hose from sharp edges.
e. Cushion the hose when the application demands the use of reciprocating machinery. In this case it is important to insure that all points of contact are cushioned to eliminate damage from the hose pulsating.

5. The Use of a modern hose tower or the use of a Marine Loading Arm can greatly eliminate or totally eliminate all hazards involved with dock hose.

Modern Hose Tower



Single Hose Loading Arm

Marine Loading Arm